CLAIMS

1. A tire distortion detecting method for detecting a distortion of a rotating tire by using a tire, in which a plurality of conductor pieces embedded in lines at predetermined intervals in a circumferential direction of the tire are embedded in two or more different layers, and a monitoring device which has a scanner unit provided in a tire house of a vehicle,

characterized in that the monitoring device radiates a pulsed electromagnetic wave from the scanner unit to a surface of the conductor piece along the line of the conductor pieces in each of the layers,

causes the scanner unit to receive the pulsed electromagnetic wave reflected from the conductor piece in each of the layers and a member other than the conductor pieces,

repeatedly measures time from when the pulsed electromagnetic wave is radiated to when the reflected pulsed electromagnetic wave is received,

stores, as a reference value, time at which no distortion occurs on the tire, and

compares the measured time with the stored reference value to detect a distortion of the tire.

2. The tire distortion detecting method according to claim 1, characterized in that the monitoring device radiates one or more pulsed electromagnetic waves in an interval of a smaller distance or length out of a distance between the conductor pieces adjacent to each other in the circumferential direction of the tire or a length of the conductor piece arranged in the circumferential direction of the tire, so that the time measurement is conducted on all the conductor pieces and between the adjacent conductor pieces.

3. The tire distortion detecting method according to claim 1, characterized in that the monitoring device uses a frequency of 1 GHz or higher to radiate the pulsed electromagnetic wave.

4. A tire distortion detector for detecting a distortion of a tire in running of a vehicle, the detector being constituted of:

a tire, in which a plurality of conductor pieces embedded in lines at predetermined intervals in a circumferential direction of the tire are embedded in two or more different layers, and

a monitoring device which has a scanner unit provided in a tire house of the vehicle,

characterized in that the monitoring device comprises:

means for radiating a pulsed electromagnetic wave from the scanner unit to a surface of the conductor piece along the line of the conductor pieces in each of the layers of the tire,

means which is provided in the scanner unit and receives the pulsed electromagnetic wave reflected by the conductor piece in each of the layers of the tire and a member other than the conductor piece,

means for measuring time from radiation of the pulsed electromagnetic wave to reception of the reflected pulsed electromagnetic wave,

means for alternately repeating the radiation of the pulsed electromagnetic wave and the reception of the reflected pulsed electromagnetic wave,

means for storing, as a reference value, time at which no distortion occurs on the tire, and

means for comparing the measured time and the stored reference value to detect a distortion of the tire.

5. The tire distortion detector according to claim 4, characterized in that the conductor pieces are embedded in the tire so that surfaces

of the conductor pieces are almost in parallel with a surface of a tire tread.

6. The tire distortion detector according to claim 4, characterized in that the conductor pieces are embedded in the tire so that the surfaces of the conductor pieces are almost in parallel with a surface of a side wall of the tire.

7. The tire distortion detector according to claim 4, characterized in that the pulsed electromagnetic wave is set at a frequency of 1 GHz or higher.

8. The tire distortion detector according to claim 4, characterized in that at least in an outermost line of the conductor pieces relative to an axis of rotation of the tire at the center, the conductor pieces are arranged at regular intervals in the circumferential direction of the tire to set a length of the conductor piece in the circumferential direction of the tire equal to a length of a gap between the adjacent conductor pieces.

9. The tire distortion detector according to claim 4, characterized in that the conductor pieces are arranged so that in a second series of conductors provided inside a first series of conductors, ends of the conductor piece in the circumferential direction of the tire overlap, by a predetermined length, ends of the conductor piece in the circumferential direction of the tire in the first series of conductors which is outermost relative to an axis of rotation of the tire at the center.

10. A tire, characterized in that series of conductors are embedded in two or more different layers with a part having no overlapping surfaces, the series of conductors being composed of a plurality of conductor pieces embedded in lines at predetermined intervals in a circumferential direction of the tire.

11. The tire according to claim 10, characterized in that the conductor pieces are embedded in the tire so that the surfaces of the conductor pieces are almost in parallel with a surface of a tire tread.

12. The tire according to claim 10, characterized in that the conductor pieces are embedded in the tire so that the surfaces of the conductor pieces are almost in parallel with a surface of a side wall of the tire.

13. The tire according to claim 10, characterized in that at least in an outermost line of the conductor pieces relative to an axis of rotation of the tire at the center, the conductor pieces are arranged at regular intervals in the circumferential direction of the tire to set a length of the conductor piece in the circumferential direction of the tire equal to a length of a gap between the adjacent conductor pieces.

14. The tire according to claim 10, characterized in that the conductor pieces are arranged so that in a second series of conductors provided inside a first series of conductors, ends of the conductor piece in the circumferential direction overlap, by a predetermined length, ends of the conductor piece in the circumferential direction of the tire in the first series of conductors which is outermost relative to an axis of rotation of the tire at the center.

15. The tire according to claim 10, characterized in that the conductor pieces are arranged at regular intervals in the same layer.

16. The tire according to claim 10, characterized in that the conductor pieces of the layers are arranged so that the conductor pieces in the two different layers are alternately arranged in the circumferential direction of the tire.

17. The tire according to claim 16, characterized in that the conductor pieces of the layers are arranged so that the conductor pieces

partly overlap each other in the circumferential direction of the tire.

18. The tire according to any one of claims 10 to 17, characterized in that the conductor pieces of the layers are displaced from each other in a width direction of the tire.